TECHNOLOGY DEVELOPMENT DATA SHEET



Liquid Membrane System for Removal and Concentration of Transuranic Elements



Developer: LSR Technologies, Inc.

Contract Number: DE-AR21-96MC33080

Crosscutting Area: ESP

Tanks FOCUS AREA

Problem:

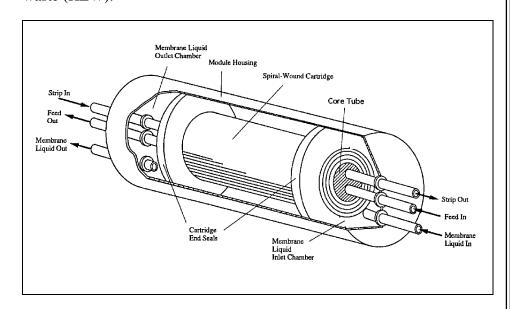
The treatment and disposal of radioactive waste generated in past plutonium operations represents an immense technical and economic challenge. In the case of the Hanford tank sludge wastes, a baseline approach has been defined in which the sludges will be leached with a high caustic solution to dissolve certain nonradioactive components. The leached sludge, which contains transuranics (TRUs), Strontium-90 (90Sr), etc. will then be vitrified for geologic disposal. The cost of this baseline scheme has been estimated to be \$3 billion. Furthermore, there may not be enough space available in a deep geological repository.

Solution:

There are technical and economic incentives to apply advanced processes to separate the radioactive and nonradioactive components of Hanford tank waste and drastically reduce the volume of high-level waste. The transuranic extraction (TRUEX) process and the strontium extraction (SREX) process have been proposed to accomplish this goal. Reliable,

efficient, and compact systems are required to successfully implement the TRUEX and SREX processes. A new Moving Liquid Membrane System (MLMS) will be employed for selective removal and concentration of TRUs and ⁹⁰Sr from dissolved tank waste, thereby minimizing the volume of high-level waste (HLW).

- ► Compact modular system with flexible operating conditions and automated controls for reduced worker exposure to radioactive environment
- ► Stable performance with reduced chemical and extractant consumption

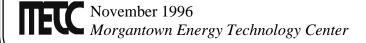


Benefits:

- ► High TRUs and ⁹⁰Sr removal selectivity and concentration factor
- Significant reduction of HLW volume

Technology:

The overall goal of this project is to develop and demonstrate the MLMS for selective removal and concentration of transuranic elements and ⁹⁰Sr from radioactive waste streams. The unique MLMS





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has been demonstrated in two different applications and in a non-radioactive environment: (1) heavy metals removal and concentration from industrial wastewater, (2) selective H₂S removal from H₂S/CO₂-containing gaseous streams. Both plate-and-frame and spiral-wound MLMs modules have been developed and demonstrated.

The advantages of the MLMS include: (1) combination of nondispersive extraction and stripping steps in one single unit with simplified control and operation; (2) maintenance: reduced elimination of equilibrium limitations encountered in a conventional twostep process and reduction of chemical inventory and consumption; (4) elimination of instability of conventional supported liquid membrane system due to liquid membrane configuration; and (5) compact, modular system with high selectivity and concentration power.

The technical challenges for using MLMS in the TRUEX and SREX processes are the development of radiation-resistant membrane modules and their evaluation using actual dissolved Hanford tank waste. The extractants for TRUs and 90Sr are commercially available.

The MLMS will initially be developed and optimized with cold, simulant feed solutions, and then subjected to evaluation with an actual waste stream.

Contacts:

LSR Technologies, Inc. is a small research and development firm based in Acton, MA. LSR has been an active participant in various development and demonstration programs in the field of pollution control and prevention, sponsored by DOE and EPA. For information on this project, the contractor contact is:

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DOE's Morgantown Energy Technology Center supports the Environmental Management - Office of Science and Technology by contracting the research and development of new technologies for waste site characterization and cleanup. For information regarding this project, the DOE contact is: DOE Project Manager: Venkat K. Venkataraman Morgantown Energy Technology Center

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